MODULAR PLATFORM, WALKWAY OR RAMP

Field of invention

The present invention relates to platforms, walkways or ramps and in particular to modular pre-built or temporary platforms, walkways and ramps. However, the present invention is not limited to temporary platforms, walkways and ramps but also relates to permanent platforms, walkways and ramps.

Background to the invention

A large number of existing buildings do not include wheelchair access and as such there is a need to be able to modify existing buildings to include ramp access. While ramps can be retrofitted to buildings, they are typically designed for a specific building and therefore cannot usually be duplicated for other buildings.

There is also a need for cost effective ramps for new buildings, and for cost effective platforms and walkways.

Patent searches have revealed three patent specifications, namely United States patent No. 5,740,575, and Australian patent No. 577569 and associated Australian patent No. 589013, which disclose ramp kits comprising modular components that can be assembled to form ramps. The ramp kit of US 5,740,575 discloses a stand having support rails which extend between corresponding support posts, the rails being height adjustable to support an inclined ramp surface at a particular position along its length. However, the ramp of this US specification has a number of significant limitations. Firstly, the support stand is relatively bulky making it difficult to transport the components which are required to form a ramp. Secondly, the range of height adjustment is quite limited and thirdly, height adjustment of each stand is reasonably time consuming as it involves alignment of holes formed in each end of two support rails with holes of support posts for subsequent insertion of two locating bolts.

Australian patent Nos. 577569 and 589013 disclose a ramp kit having threaded support posts which are height adjustable to support an inclined ramp surface at a particular position along its length. Height adjustment is provided by threadable movement of a support nut along the length of the threaded support post. However, the ramps disclosed in these Australian patents appear to be quite cumbersome and costly to manufacture. Furthermore, their stability may be less than desirable in certain applications.

Summary of the invention

In a first aspect, the present invention provides a deck support which is adjustable to support a deck of a platform, walkway or ramp at a predetermined elevation, the deck support comprising a prefabricated moveable member arranged to engage a corresponding elongate member for retention and longitudinal movement relative to the elongate member, the prefabricated moveable member having an extension arranged to directly support the deck laterally of the elongate member by contact with an underneath surface of the deck and wherein the prefabricated moveable member is locatable at predetermined longitudinal positions relative to the elongate member.

In a second aspect, the precent invention provides a deck support which is adjustable to support a deck of a platform, walkway or ramp at a predetermined elevation, the deck support comprising a prefabricated moveable member and a corresponding elongate member, the prefabricated moveable member being arranged to engage the elongate member for retention and longitudinal movement relative to the elongate member, the prefabricated moveable member having an extension arranged to directly support the deck laterally of the elongate member by contact with an underneath surface of the deck and wherein the prefabricated moveable member is locatable at predetermined longitudinal positions relative to the elongate member.

The prefabricated moveable member is preferably a slideable member arranged to slide along at least part of the longitudinal length of said elongate member.

In one embodiment of the second aspect of the present invention, the elongate member is a slotted tube and the slideable member is arranged to slide axially within the tube, the slot allowing for axial movement of the extension. However, in the preferred embodiment, the slideable member is arranged to at least partially encircle the elongate member for slideable axial movement relative to the elongate member.

The slidable member may be a collar, sleeve or other tubular member, for example of round, square, rectangular, or c-shaped section. The slideable member may be a partly tubular member having a section corresponding to a partial section of a tubular member. Alternatively, the slideable member may be a tubular member having a section corresponding to a combination of said partly tubular members.

The slideable member preferably has a hole formed in one or more of its one or more walls arranged for alignment with corresponding axially spaced holes of the elongate member and receipt for a locating pin for retention of the elongate member.

In the preferred embodiment, the elongate member comprises a tube or rod correspondingly shaped to the slideable member and may be formed of a metallic material.

The extension may comprise a support lug which is arranged to extend normally of a longitudinal axis of the elongate member. Suitably, the extension comprises a support bearer. In the preferred embodiment, the deck support comprises two prefabricated moveable members positioned at opposite ends of said support bearer. The preferred embodiment of the first and second aspects of the present invention comprises another form of the deck support which has two or more support bearers that extend from a common slideable member.

The support bearer may be formed of any suitable material and may be a support beam.

The deck support of the second aspect of the present invention preferably further comprises a foot member arranged for attachment to an end of the elongate member. The foot member is preferably removably attachable to the elongate member and may have a cavity for receipt of an end of the elongate member. The foot member is preferably pivotable relative to the elongate member to accommodate sloping supporting surfaces. The foot member may comprise a plate. The foot member may be integrally formed with the elongate member.

Suitably, the elongate member is arranged to allow any required range of adjustment of the deck support. However, the maximum range of adjustment typically required is 1.2 metres. A range of adjustment of 700mm should be suitable for most platform, walkway or ramp applications, and a range of adjustment of 500mm is likely to be most commonly required. Therefore, the preferred embodiment provides at least three different elongate members providing the different ranges of adjustment referred to above. In an alternative embodiment, the elongate member is adjustable in length. In this alternative embodiment, the required range of adjustment of the deck support is preferably provided by a combination of adjustment of the length of the elongate member and axial movement of the prefabricated moveable member. However, the required adjustment of the deck support of the first and second aspects of the present invention may be provided solely by adjustment of the length of the elongate member in which case movement of the prefabricated moveable member is not required. In another alternative embodiment, the length of the elongate member is sufficient to accommodate the ranges of adjustment referred to above.

The length of the elongate member may be adjustable by attachment of another elongate member. The length of the elongate member may also be telescopically adjustable.

The prefabricated moveable member preferably further comprises a handrail support arranged to support one or more prefabricated handrails above the deck.

Suitably, said prefabricated moveable member comprises a handrail support member arranged to support one or more prefabricated handrails above said deck. The handrail support member is preferably arranged to receive a lower end of a handrail upright of a prefabricated handrail. The preferred embodiment includes a handrail support member which is arranged to receive two adjacent handrail uprights of different prefabricated handrails.

The handrail support member may comprise a collar, sleeve or other tubular member, for example of round, square or rectangular or c-shaped section. The handrail support member may also be a partly tubular member having a section of corresponding to a partial section of a tubular member. Alternatively, the handrail support member may be a tubular member having a section corresponding to a combination of said partly tubular members.

The handrail support member may be oversized for inclination of said handrail upright relative to said elongate member, in a plane which is substantially normal to said extension. Oversized handrail support members enable prefabricated handrails having handrail uprights which are normal of corresponding rails to be used with both inclined and horizontal portions of a deck.

The handrail support member preferably comprises handrail upright abutting means arranged to abut a lower end of said handrail up right. The handrail upright abutting means preferably comprises an end portion of an external surface of said support bearer.

In the preferred embodiment, said extension comprises one or more handrail support members positioned at predetermined positions along its length. One form of the deck support of the preferred embodiment includes a support bearer having two handrail support members positioned adjacent each other at a region approximately midway along its length.

The elongate member may comprise a roof support for supporting a roof. Suitably, said roof support comprises said elongate member and may include the prefabricated moveable member. In the preferred embodiment, the elongate member is arranged to slideably receive a roof support upright for abutment of a lower end of the roof support upright against an upper edge of said prefabricated moveable member.

In a fourth aspect, the present invention provides a method of erecting a platform, walkway or ramp comprising the steps of:

providing a plurality of deck supports which are adjustable to support a deck of a platform, walkway or ramp at a predetermined elevation, each of the deck supports comprising a prefabricated moveable member and a corresponding elongate member, the prefabricated moveable member being arranged to engage the elongate member for retention and longitudinal movement relative to the elongate member, the prefabricated moveable member having an extension arranged to directly support the deck laterally of the elongate member by contact with an underneath surface of the deck and the prefabricated moveable member being locatable at predetermined longitudinal positions relative to the elongate member;

adjusting the deck supports by longitudinally moving said prefabricated moveable members relative to corresponding elongate members;

positioning and orientating the deck supports so that their extensions are arranged to support corresponding portions of a deck at a desired elevation; and

placing the deck onto the extensions so that the extensions support corresponding portions of the deck to form an erected platform, walkway or ramp.

The method of the fourth aspect of the present invention may comprise one or more further steps including:

providing a plurality of prefabricated deck segments arranged to collectively form a deck of a platform, walkway or ramp; and

transporting prefabricated deck segments to a platform, walkway or ramp location where a platform, walkway or ramp is to be erected.

In a fifth aspect, the present invention provides a modular apparatus for constructing a platform, walkway or ramp, said modular apparatus comprising:

a plurality of prefabricated deck segments arranged to collectively form a deck of a platform, walkway or ramp; and

a plurality of deck supports for supporting the prefabricated deck segments to form said deck; wherein

each deck support is adjustable to support a deck of a platform, walkway or ramp at a predetermined elevation, each deck support comprising a prefabricated moveable member and a corresponding elongate member, the prefabricated moveable member being arranged to engage the elongate member for retention and longitudinal movement relative to the elongate member, the prefabricated moveable member having an extension arranged to directly support the deck laterally of the elongate member by contact with an underneath surface of the deck, the prefabricated moveable member being locatable at predetermined longitudinal positions relative to the elongate member.

In a sixth aspect, the present invention provides a platform, walkway or ramp assembly, said assembly comprising:

a plurality of deck supports which are each adjustable to support a deck of a platform, walkway or ramp at a predetermined elevation, each deck support comprising a prefabricated moveable member and a corresponding elongate member, the prefabricated moveable member being arranged to engage the elongate member for retention and longitudinal movement relative to the elongate member, the prefabricated member having an extension arranged to directly support the deck laterally of the elongate member by contact with an underneath surface of the deck and the prefabricated moveable member being locatable at predetermined longitudinal positions relative to the elongate member; and

a plurality of prefabricated deck segments;

wherein said prefabricated deck segments are supported by the extensions of said deck supports to form a platform, walkway or ramp.

In the preferred embodiment, the support bearer is arranged to extend substantially normally of a longitudinal axis of a walkway or ramp.

Suitably the modular apparatus and assembly of the respective fifth and sixth aspects of the present invention further include one or more prefabricated handrails, each of the prefabricated handrails comprising one or more rails supported by one ore more handrail uprights, the prefabricated handrails being arranged for attachment to one or more said deck supports. Suitably, the prefabricated handrails are arranged for attachment to the prefabricated moveable member. The prefabricated handrails preferably include two handrail uprights which are preferably balusters. The prefabricated handrails are preferably arranged for substantial upright orientation of the handrail uprights when attached to an inclined portion of a ramp. The rails are preferably tubular in form.

In the preferred embodiment, the modular apparatus and assembly of the respective fifth and sixth aspects of the present invention comprise one or more prefabricated handrail joining members arranged to join ends of adjacent prefabricated handrails. The prefabricated handrail joining members may be arranged to overlie an upper surface of said rails, but preferably comprise a sleeve arranged for insertion into ends of said rails.

The deck may be a floor or platform.

One or more edges of said prefabricated deck segments are preferably folded to provide adjacent first and second angular regions. The first and second angular regions preferably comprise a curb. The first angular region preferably extends substantially normally of a plane in which the deck segment lies, while the second angular region preferably extends away from the deck segment for form an enclosed angle with the first angular region of approximately 45°.

Suitably the modular apparatus and assembly of the respective fifth and sixth aspects of the present invention comprise curb segments arranged to join curbs of adjacent inclined prefabricated deck segments.

Brief description of the drawings

The invention will now be further described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view of a ramp providing access to a house;

Figure 2a is a plan view of the ramp and house of Figure 1;

Figure 2b is a schematic exploded assembly diagram showing prefabricated floor panels and handrails as supported by a prefabricated floor bearer;

Figure 2c is a schematic exploded assembly diagram showing a double landing and an incline region attached thereto;

Figure 2d is a schematic exploded assembly diagram showing a landing, incline region and prefabricated floor bearer;

Figures 3a and 3b are respective front and plan elevational views of a 15 prefabricated floor bearer;

Figures 4a, 4b, 4c, 4d and 4e are elevational views of a pillar or parts thereof;

Figures 5a, 5b and 5c are side and detailed end elevational views of a prefabricated handrail;

Figures 6a and 6b are side and end elevational views of a prefabricated handrail which is shorter in length than, but otherwise identical to, the prefabricated handrail of Figures 5a, 5b and 5c;

Figure 7 is a detailed plan view of one end of the bearer of Figures 3a and 3b;

Figures 8a, 8b and 8c are respective plan, end and detailed side views of a prefabricated floor panel;

Figures 9a and 9b are side and end elevational views of a prefabricated termination handrail;

Figures 10a and 10b are side and end elevational views of an alternative prefabricated termination handrail;

Figures 11 a and 11 b are side and end elevational views of a handrail end cap;

Figure 12 is a side elevational view of a 180° joiner suitable for joining adjacent prefabricated handrails;

Figures 13a, 13b, 13c and 13d and 13e are respective plan, end, side and detailed end views of a prefabricated transition floor plate;

Figures 14a, 14b and 14c, and 14c and 14e are respective elevational views of a prefabricated transition floor plate support beam and plastic cap of that support beam;

Figures 15a, 15b, 15c and 15d are respective plan, underside and detailed end views of a prefabricated double landing floor panel;

Figures 16a and 16b, and 16c and 16d are side and plan views of respective prefabricated internal and external support beams of a double landing;

Figures 17a, 17b and 17c are side, end and detailed end views of a prefabricated double landing handrail;

Figures 18a and 18b are side and end elevational views of a pipe which joins opposed prefabricated double landing handrails;

Figure 19 is a plan view of a 90 pipe joiner for forming handrails;

Figure 20 is a perspective view of a curb adaptor;

Figures 21 a, 21 b, 21 c and 21 d are plan, underside, end and detailed elevational views of a prefabricated landing floor panel;

Figures 22a and 22b are side and plan elevational views of a prefabricated internal landing support bearer;

Figures 23a and 23b are side and plan elevational views of a prefabricated external landing support bearer;

Figures 24a and 24b are side and plan elevational views of a prefabricated junction landing support bearer;

Figures 25a and 25b are plan and end elevational views of a different curb adaptor to that of Figure 20;

Figures 26a and 26b are front and side elevational views of steps;

Figure 27 is a schematic end elevational view of a ramp of Figures 1 and 2 5 which includes a roof and corresponding roof pillars;

Figure 28 is a disassembled schematic view of the roof of Figure 27 and a corresponding roof pillar;

Figure 29 is a schematic plan view of one segment of the roof of Figure 27;

Figure 30a is a transverse sectional view through the roof of Figure 27 showing attachment of the roof to the roof pillars;

Figure 30b is a detailed plan view of the roof of Figure 27 showing attachment to the roof pillars;

Figure 31a is an elevational view showing attachment of the roof to roof pillars at double landing of the ramp;

Figure 31b is a plan view of the region of the ramp shown in Figure 31 a showing attachment of the roof to a roof pillar; and

Figure 31c is a plan view of a roof pillar and corresponding roof bearer of the roof of Figure 31a.

Best mode of carrying out the invention

Figures 1 and 2 depict a modular ramp 10 formed of a number of prefabricated components which are described below. As will be clear from the description of the

modular ramp 10, it will be readily apparent to a person skilled in the relevant art, that components forming the modular ramp 10 can be used, in a similar manner, to form a platform or walkway. In the case of a walkway, the height of the floor bearers are adjustable so that the floor surface is generally level, rather than inclined. In the case of a platform, the size of the floor components and the length of the floor bearers can be increased.

Referring to Figures 1 and 2, the modular ramp 10 generally comprises a raked floor 12, elongate members in the form of floor pillars 14 and 15, and handrails 16, all formed of prefabricated components. The modular ramp 10 also comprises a number of different regions: an initial incline region 18; incline regions 20 and 22; a double landing 24 and a landing 26. The initial incline region 18 and incline regions 20 and 22 comply with the relevant standards for ramps and in this particular embodiment are designed in accordance with Australian Standard. The length of the modular ramp 10 is adjusted so that the landing 26 is appropriately positioned relative to a doorway 28 of a house 30 for wheelchair access to the house 30.

Figures 2b, 2c and 2d generally show assembly of prefabricated components which form the incline regions 20 and 22, double landing 24 and landing 26 respectively. Referring to Fig 2b, the incline regions 20 and 22 are formed of floor segments, one example of which is prefabricated floor panel 32 and prefabricated handrails 91 which are supported by prefabricated floor bearers 34 and floor pillars 14 or 15.

The double landing 24 of figure 2c generally comprises a floor segment, one example of which is prefabricated double landing floor panel 130 which is supported by prefabricated internal and external double landing support bearers 150 and 152 respectively. The double landing 24 also has prefabricated double landing handrails 168 and double landing handrails 178. Ends of incline regions 20 and 22 (incline region 20 not shown in figure 2c) which meet the double landing 24 are also supported by the prefabricated internal double landing support bearer 150.

Referring to figure 2d, the landing 26 generally comprises a prefabricated landing floor panel 182, prefabricated landing handrails 250 and landing pipes 252 which are supported by prefabricated internal, external, and junction landing support bearers 202, 204 and 206 respectively. Prefabricated floor panels 32 which meet the prefabricated landing floor panel 182 are also supported by the prefabricated internal and junction landing support bearers 202 and 206 respectively.

Before explaining details of regions 18-26, details of components relating to the raked floor for 12 and pillars 14 are generally described by reference to components which form the incline regions 20 and 22. The raked floor 12 is formed of a number of prefabricated floor segments, an example of which are prefabricated floor panels 32 (see Figures 2b, 8a, 8b and 8c) which extend between adjacent prefabricated floor bearers 34 (see Figures 3a and 3b). Referring to Figures 4a, 4b, 4c and 4d floor bearers 34 are supported by elongate members or in this example floor pillars 14 and 15.

Referring to Figures 8a, 8b and 8c, prefabricated floor panels 32 comprise a 3 millimetre thick aluminium plate 40 which is folded on side edges to form ramp curbs, one example of which is curbed edge 42. The aluminium plate 40 has a non-slip surface 44 provided by a chequered pattern 46. The curbed edge 42 comprises a normal fold region 48 which extends normally of an upper surface of the aluminium plate 40, a distance of 70 mm, and a lateral fold region 50 which extends at an angle of 45° relative to the normal fold region 48, a distance of 30 mm. The aluminium plate 40 is 2,406 mm in length and has a width of 1,000 mm between inner surfaces of opposed normal fold regions 48. A shorter length aluminium plate (not shown) is 1,203 mm in length and otherwise identical to the aluminium plate 40.

The aluminium plate 40 is reinforced by two 60 x 40 x 3 aluminium tubes 52 which are TIG welded to the aluminium plate 40 so that their longitudinal axes are spaced 320 mm from adjacent outer surfaces of the normal fold region 48. The length of the aluminium tubes 52 is such that both ends are spaced 30 mm from end edges of the aluminium plate 40. The aluminium tubes 52 are welded to the aluminium plate via pairs of welds which extend along the length of the aluminium tubes at a spacing of 300 mm from each other. However, it will be readily appreciated by a person skilled in the relevant art that the aluminium tubes 52 can be otherwise attached to the aluminium plate. For example, the aluminium tube 52 can be screwed to the aluminium plate 40.

Three oval shaped holes 54 are formed in each end of the aluminium plate 40. The holes are 10 mm in length and 8 mm across. The holes 54 are positioned so that their centres are ten mm from the end of the aluminium plate 40, and 150 mm from the inner surface of the normal fold region 48 or, in the case of the central hole, aligned with a longitudinal axis of the aluminium plate 40.

The prefabricated floor bearers 34 (see figures 2b, 3a and 3b) are formed of 50 x 50 x 2.5 RHS galvanised steel tubes 35 which have sleeves 56 and 58 attached at each end for respective receipt of floor pillars 14 and/or 15 and handrail balusters 60 (see Figures 4a, 4b,

4c and 4d of sheets 6/30 and 18/30, and Figures 5a and 5b). In this example, the sleeves 56 and 58 are the prefabricated moveable members each having a common extension in the form of the floor bearer 34. As will be readily apparent to a person skilled in the relevant art, walls of the tubes 35 can be thicker than 2.5 mm, for example, 3.5 mm or 6.0 mm, and the sleeves 58 can be formed of material other than galvanised steel, for example, polyglass. The sleeves 56 are formed of a 195 millimetre length of 40 x 40 x 1.6 RHS galvanised steel tubes (see Figure 1). The sleeves 58 are formed of a 90 x 40 x 2.0 folded galvanised steel tube which is designed to sit on top of the prefabricated floor bearers 34 so that upper end 62 of the sleeve 58 is level with an upper end of the sleeve 56. Referring to Figure 7, sleeves 56 and 58 are welded together via welds 64 and 66. The prefabricated floor bearer 34 is 1.15 metres long.

Outer ends of the prefabricated floor bearer 34 and the external surface of inner walls 70 of the sleeves 56 and 58 are attached via welds 68.

Referring to Figure s 2b,4a, 4b, 4c and 4d, the elongate members in the form of floor pillars 14 and 15 are formed of 35 x 35 x 1.6 mm RHS galvanised steel tube having lengths of 600 and 1,000 mm respectively. The floor pillars 14 have six holes 72, 74, 76, 78, 80 and 82 formed in opposite walls while the floor pillar 15 has 9 of these holes. The holes are spaced from each other by 100 mm, the lowest hole 72 being 60 mm from lower ends of the floor pillars. Different length floor pillars (not shown) are available having appropriately spaced hoes for applications where greater and smaller ranges of adjustment are required. Lower ends of floor pillars 14 and 15 threadably attach to a pivotable foot 84. The floor pillars 14 and 15 may be attached directly to a supporting surface such as a concrete slab, via dynabolts which pass through holes 86 of the pivotable foot, or may be supported by a supporting surface such as earth via bearing pads 87 (see Figure 4e) which the pivotable foot 84 can be bolted to.

The floor pillars 14 and 15 are designed to slide within the sleeves 56 for adjustment of the elevation of the prefabricated floor bearers 34 by alignment of one of the pairs of holes 72, 74, 76, 78, 80 and 82 (in the case of the floor pillar 14) with holes 89 formed in opposite walls of the sleeves 56. Thus, the pillars 14 and 15 are arranged for longitudinal and in this case slideable movement relative to the sleeves 56. Locating pins 83 (see Figures 2c and 2d) are passed through the aligned holes 89 in the sleeve 56 and the selected pairs of holes, such as 72, in the floor pillar 14 or 15 for retention of the pillar 14 or 15.

The incline regions 20 and 22 are formed by positioning one prefabricated floor bearer 34 at each end of a prefabricated floor panel 32 and subsequently loosely attaching

the prefabricated floor panel 32 thereto via screws. The elevation of the prefabricated floor bearers 34 positioned at either end of the prefabricated floor panel 32 are adjusted as described above to provide the appropriate amount of incline.

Alternatively or additionally, incline of prefabricated floor or deck segments can be adjusted after initial assembly of adjacent floor or deck segments. However, the height of prefabricated floor bearers is preferably set before the prefabricated floor panels 32 are firmly attached to corresponding prefabricated floor bearers 34 by tightening of screws.

The assembled prefabricated floor bearers 34 and prefabricated floor panel 32 is then supported on a supporting surface so that the prefabricated floor bearers 34 are approximately vertical, the pivotable feet 84 pivoting to accommodate for a sloping supporting surface.

Incline regions 20 and 22 are completed by joining ramp segments comprising prefabricated floor panels 32 and two prefabricated floor bearers 34 with ramp segments comprising a prefabricated floor panel 32 and a single prefabricated floor bearer 34. Adjacent prefabricated floor panels 32 are attached to a common prefabricated floor bearer 34 so that adjacent abutting edges of the prefabricated floor panels 32 are substantially aligned with a longitudinal axis of the prefabricated floor bearer 34.

Handrails 16 are attached upon assembly of ramp segments. Alternatively, handrails 16 can be used to maintain adjacent prefabricated floor bearers 34 in an upright position prior to attachment of an adjoining prefabricated floor panel 32 by assembly of adjacent prefabricated floor bearers 34 and adjoining handrails 16. The handrails 16 are formed of prefabricated handrails 91 (see Figures 2b,5a, 5b and 5c). The prefabricated handrails 91 have two hand rail balusters 88 and 90, and lower and upper handrails 92 and 94 respectively. The hand rail balusters 88 and 90 are formed of 35 x 35 x 1.6 RHS galvanised steel tube. The distance between opposite outer surfaces of hand rail balusters 88 and 90 of the prefabricated hand rail 91 is 2,400 mm. The handrails 92 and 94 are formed of 25 NB light pipe and are attached to the balusters 88 and 90 so that a longitudinal axis of the lower hand rail 92 is spaced 425 mm from an upper surface of the upper hand rail 94 (as viewed in Figures 5a and 5b) and 475 mm from a lower end (also as viewed in Figures 5a and 5b) of hand rail balusters 88 and 90.

The hand rail balusters 88 and 90 are angled relative to the handrails 92 and 94 such that one end of the balusters 88 and 90 is offset 64 mm relative to a vertical line which intersects the other end of the balusters. This relative angle between the balusters 88 and 90 and handrails 92 and 94 positions the handrails 92 and 94 so that they are substantially

parallel to longitudinal edges of prefabricated floor panels 32 when the balusters 88 and 90 are positioned approximately vertically.

The handrails balusters 88 and 90 are designed to slide into the sleeves 58 (see Figures 3a and 3b). Each sleeve 58 is designed to receive hand rail balusters 88 and 90 of adjacent prefabricated handrails 91. Adjacent hand rail balusters 88 and 90 are positioned in the sleeve 58 so that abutting walls substantially align with a longitudinal axis of the prefabricated floor bearer 34.

Referring to Figure 12, adjacent prefabricated handrails 91 are joined by 180° joiners 96. Opposite ends 98 and 100 of the 180° pipe joiners are appropriately dimensioned to be slidably received within handrails 92 and 94 of adjacent prefabricated handrails 91.

Referring to Figures 1, an end of the hand rail 16 which corresponds to the initial incline region 18 is provided by a prefabricated termination hand rail 102 (see Figures 9a and 9b). The prefabricated termination hand rail 102 is formed of a pipe having an outer diameter of 35 mm and is attached to an adjacent prefabricated hand rail 91 via pipes 103 (see Figures 9a and 9b) which have an outside diameter of 27 mm. The pipes 103 are slidably received within the prefabricated termination hand rail 102 and the prefabricated hand rail 91.

Prefabricated termination hand rail 104 of Figures 10a and 10b is suitable, for example, for use in relation to steps providing access to a platform, walkway or ramp. An upper portion 106 of the prefabricated termination hand rail 104 (as viewed in Figure 10a) is offset 360 mm in a vertical plane relative to a lower portion 108. This distance varies in accordance with dimensions of steps which the prefabricated termination hand rail 104 is designed for.

Referring to Figures 13a, 13b, 13c, 13d and 13e, the initial incline region 18 (see figure 1) is formed of a prefabricated transition floor plate 110 which is similar to the prefabricated floor panel 32, but differs in the following respects. Like features of the prefabricated floor panel 32 and prefabricated transition floor plate 110 are referred to by common reference numerals. The prefabricated transition floor plate 110 is only 600 mm in length. In place of the aluminium tubes 52 it has two tapered aluminium support plates 112 and 114 which maintain an upper surface of the prefabricated transition floor plate 110 in an inclined position. The tapered plates 112 and 114 are 540 mm long and 50 mm wide at one end. Opposed folded end regions 116 and 118 of the prefabricated transition floor plate 110 are 25 mm wide and extend at an angle of 5 relative to the prefabricated transition floor plate 110. The end fold region 116 extends in a downward direction and is designed

to abut a lower end of a prefabricated floor panel 32 which is positioned at a lower end of the modular ramp 10, while the other end fold region 118 is designed to rest on a supporting surface. Normal fold of region 119 of the prefabricated transition floor plate 110 tapers from a maximum width of 70 mm at the end fold region 116, to a minimum width of 25 mm at the opposite end of the fold region 118. Holes are positioned at the end fold region 116 in a similar manner to that described above in relation to the prefabricated floor panel 32. Holes are not formed in the end fold region 118.

Referring to Figures 14a, 14b and 14c, the initial incline region 18 is supported by a prefabricated transition floor plate support beam 120 which is described by comparison with the prefabricated floor bearer 34 of Figures 3a and 3b. Like features of the prefabricated transition floor plate support beam 120 and prefabricated floor bearer 34 are referred to by common reference numerals. The prefabricated transition floor plate support beam 120 includes a galvanised steel tube 35 identical to the galvanised steel tube 35 of the prefabricated floor bearer 34. Hand rail baluster sleeves 121 are formed of 90 x 40 x 2.0 folded galvanised steel rather than 94 x 40 x 2.0 folded galvanised steel. Referring also to Figures 14d and 14e, a square shaped plastic cap 122 is positioned in corresponding ends of each of the hand rail baluster sleeves 121 to leave room for receipt of one hand rail baluster. The prefabricated transition floor plate support beam 120 includes securing brackets 124 for attachment of the prefabricated transition floor plate support beam 120 to, for example, a bearing pad 87 (see Figure 4e) or a concrete slab. The securing brackets (124 are 50x50 angle, one end of an upright wall 126 of which (as viewed in Figure 14c) tapers from its base. A hole 128 is formed in a horizontal wall 129 (as viewed in Figure 14a) of the securing bracket 124, adjacent the tapered end of the upright wall 126.

Referring to Figures 2c,15a, 15b, 15c and 15d, the double landing 24 is formed of a prefabricated double landing floor panel 130 which differs from the prefabricated floor panel 32 as follows. Like features of the floor panels 130 and 34 are referred to by common reference numerals. The prefabricated double landing floor panel 130 is 2,200 mm long (excluding lateral curb edges 138 and 140) and 1,203 mm wide (excluding longitudinal curb edge 132). The prefabricated double landing floor panel 130 includes three additional oval shaped holes 54. Centres of the two centrally positioned oval shaped holes 54 are spaced apart by 510 mm while centres of the remaining oval shaped holes 52 are spaced apart by 350 mm. The prefabricated double landing floor panel 130 includes one longitudinally positioned aluminium tube 134 and five laterally positioned aluminium tubes 136. The

tubes 134 and 136 differ in length to the aluminium tubes 52 of the prefabricated floor panel 32 but are otherwise identical.

The aluminium tube 134 is spaced apart from the closest longitudinal edge of the prefabricated double landing floor panel 130 by 30 mm. The length and position of the aluminium tube 134 is such that its ends are spaced 95 mm from tranversed edges of the prefabricated double landing floor panel 130 (excluding lateral curved edges 138 and 140). Each of the aluminium tubes 136 abut the aluminium tube 134 and extend normally therefrom. A central aluminium tube 136 is positioned midway along the length of the aluminium tube 134 and the remaining aluminium tubes 136 are positioned symmetrically either side of this tube. Two aluminium tubes 136 are spaced 385 mm from the central aluminium tube 136 while the remaining two aluminium tubes 136 are each spaced 745 mm from the central aluminium tube 136. The length of the aluminium tubes 136 is such that ends opposite those that abut the aluminium tube 134 are spaced 55 mm from the adjacent longitudinal edge of the prefabricated double landing floor panel 130 (excluding longitudinal curved edge 132).

The prefabricated double landing floor panel 130 is supported by prefabricated internal and external double landing support bearers 150 and 152 respectively (see Figures 2c,16a, 16b, 16c and 16d). Features of the prefabricated internal and external double landing support bearers 150 and 152 are explained by comparison with the prefabricated floor bearer 34. Like features are referred to by common reference numerals.

Referring firstly to the prefabricated internal double landing support bearer 150, galvanised steel tube 154 corresponding to tube 35 of the prefabricated floor bearer 34 are 2,440 mm long, but are otherwise identical to the galvanised steel tubes 35. Handrail baluster sleeves 156 are formed of 90 x 40 x 2.0 folded galvanised steel. The prefabricated internal double landing support bearer 150 includes two additional centrally positioned handrail baluster sleeves 158 which are positioned midway along the length of the galvanised steel tube 154 so that they are separated by 55 mm. The centrally positioned handrail baluster sleeves 158 are formed of 40 x 40 x 1.6 RHS. The length of the centrally positioned handrail baluster sleeves 158 is such that their upper ends (as viewed in Figure 16a) lies approximately in the same horizontal plane as upper ends of the handrail baluster sleeves 156. The centrally positioned handrail baluster sleeves 158 are positioned to one side of the galvanised steel tube 154 so that one of their walls is substantially aligned with a longitudinally axis of the galvanised steel tube 154.

The prefabricated external double landing support bearer 152 has a galvanised steel tube 160 which is identical to the galvanised steel tube 154 of the prefabricated internal double landing support bearer 150. Handrail baluster sleeves 162 are formed of 40 x 40 x 1.6 RHS galvanised steel.

Referring to Figures 17a, 17b and 17c, balusters 164 and 166 of prefabricated double landing handrails 168 fit into corresponding handrail baluster sleeves 156 and 162 of prefabricated internal and external double landing support bearers 150 and 152 respectively to locate prefabricated internal and external double landing support bearers 150 and 152 relative to each other. The prefabricated double landing floor panel 130 is then screwed to the prefabricated internal and external double landing support bearers 150 and 152 so that the longitudinal curbed edge 132 is supported by the prefabricated external double landing support bearer 152. Handrail ends 172 of prefabricated double landing handrails 168 are joined by double landing handrails 178 (see Figures 18a and 18b) with the use of a 90° pipe joiner 175 (see Figures 2c and 19). The prefabricated internal double landing support bearer 150 also supports one end of prefabricated floor panels 32 which extend away from the double landing 24 and form part of the incline regions 20 and 22.

The prefabricated double landing floor panel 130 can also function as a platform. To function as a platform it is assembled independently of the abutting regions of the modular ramp 10, and the handrails are appropriately positioned in accordance with the particular design of the platform. The dimensions and surface area are appropriately altered, as are the bearers and other components forming the platform. In situations where the platform is required have walkways and/or ramps extending from one or more edges, floor bearers the same as or similar to floor bearers described in relation to the modular ramp 10 are used as appropriate or alternatively, they are modified to involve a combination of parts of a such floor bearers.

The double landing 24 is completed by attaching a double landing curb adaptor 179 of Figure 20. The double landing curb adaptor 179 is a U-shaped 3 mm aluminium plate formed of the same material that forms the aluminium plate 40. The U-shaped plate is 70 mm wide and end walls 180 are separated by 190 mm. The curb adaptor 179 is designed to fit around adjacent handrail balusters of upper and lower ends of the incline regions 20 and 22 respectively, and join inside curbed edges 42 of these incline regions to form a continuous curbed edge. The modular ramp 10 also includes a continuous outer curbed edge formed by abutment of the prefabricated double landing floor panel 130 with the incline regions 20 and 22.

Components forming the landing 26 (see figure 2d) are described by comparison to components previously described. Features of components forming the landing 26 which are identical to features previouly described are referred to by common reference numerals. Referring to Figures 21 a, 21 b, 21 c and 21 d, the landing 26 includes a prefabricated landing floor panel 182. The prefabricated landing floor panel 182 includes curbed edges 184 and 186 which are similar to curbed edges 42 of the prefabricated floor panel 32. Normal fold regions 188 which correspond to normal fold region 48 of the prefabricated floor panel 32 are 75 mm rather than 70 mm wide. The prefabricated landing floor panel 182 includes five 60 x 40 x 3 galvanised steel tubes 190, 192, 194, 196 and 198.

The tube 190 is 1,110 mm long. A side wall of the tube 190 which is closest to an adjacent edge of the prefabricated landing floor panel 182 is spaced 30 mm from that edge. An end wall 200 of the tube 190 is spaced 60 mm from an adjacent edge of the prefabricated landing floor panel 182. Tubes 192 and 194 are 1,075 mm long and are spaced apart by 320 mm. The tube 194 is spaced 500 mm from the closest edge of the prefabricated landing floor panel 182. Tubes 196 and 198 are 470 mm long and are separated by 315 mm. Tube 196 is spaced apart from the tube 190 by 435 mm.

Referring to Figures 22a, 22b, 23a, 23b, 24a and 24b, the prefabricated landing floor panel 182 is supported by a prefabricated internal landing support bearer 202, a prefabricated external landing support bearer 204 and a prefabricated junction landing support bearer 206. Details of these support bearers are explained by comparison with the prefabricated internal double landing support bearer 150. Like features are referred to by common reference numerals.

The prefabricated internal landing support bearer 202 has a galvanised steel tube 208 which is 1,300 mm long and with the exception of the position of holes formed in an upper wall of the galvanised steel tube 208 for attachment thereto of the prefabricated landing floor panel 182, is otherwise identical to the galvanised steel tube 154 of the prefabricated internal landing support bearer 150.

Handrail baluster sleeve 158 is 105 mm from the closest end of the galvanised steel tube 208 and side wall 210 is positioned midway across the width of the galvanised steel tube 208. Handrail baluster sleeve 212 differs from the corresponding handrail baluster sleeve 156 of the prefabricated internal landing support bearer 150 in that it is formed of metal 2 mm rather than 2.5 mm thick.

The prefabricated internal landing support bearer 202 includes a 50 x 50 angle bracket 214 which is 75 mm in length. Two holes 216 and 218 are formed in the angle bracket 214.

The prefabricated external landing support bearer 204 includes a galvanised steel tube 220 which is 1,250 mm in length and include holes 222 and 224, but is otherwise identical to the galvanised steel tube 154 of the prefabricated internal double landing support bearer 150. Handrail baluster sleeve 158 is identical to the centrally positioned handrail baluster sleeve 158 of the prefabricated internal double landing support bearer 150.

The prefabricated junction landing support bearer 206 includes a galvanised steel tube 226 which is 1,257 mm long and includes six holes 228, but is otherwise identical to the galvanised steel tube 154 of the prefabricated internal double landing support bearer 150. Double handrail baluster sleeve 230 is identical to handrail baluster sleeve 156 of the prefabricated internal double landing support bearer 150, except that is formed of metal which is 2 mm rather than 2.5 mm thick. Handrail baluster sleeve 232 is identical to the centrally positioned handrail baluster sleeve 158 of the prefabricated internal double landing support bearer 150. The handrail baluster sleeve 232 is spaced 1,065 mm from the double handrail baluster sleeve 230 and positioned on one half of the width of an upper wall 234 of the galvanised steel tube 226. An angle bracket 236 is identical to the angle bracket 214 of the prefabricated internal double landing support bearer 202 and is spaced 70 mm from the closest end of the galvanised steel tube 226.

The prefabricated internal, external and junction landing support bearers 202, 204 and 206 respectively, are assembled as follows. A free end 240 of the galvanised steel tube 226 is supported by the angle bracket 214 of the prefabricated internal landing support bearer 202 so that the end 240 abuts a side wall 242 of the galvanised steel tube 208. The tube 226 is screwed to the angle bracket 214 by passage of screws (not shown) through holes 216 and 218 of the angle bracket 214. A free end 244 of the galvanised steel tube 220 is similarly attached to the angle bracket 236 of the prefabricated junction landing support bearer 206.

The prefabricated landing floor panel 182 is positioned on the assembled internal, external and junction landing support bearers 202, 204 and 206 respectively which are appropriately supported by pillars 14 or 15, so that the curbed edge 184 is supported by the prefabricated external landing support bearer 204.

The landing 26 is completed by attachment of handrails. A prefabricated landing handrail 250 (see Figures 1 and 2d) is identical to the prefabricated double landing handrail 168 (see Figures 17a, 17b and 17c). The prefabricated landing handrail 250 (see figures 1 and 2d) is supported via handrail baluster sleeves 212 and 158 of the prefabricated internal and external landing support bearers 202 and 204 respectively. Handrails 252 (see Figure 1) positioned over and aligned with the curbed edge 184 are provided by pipes. Ends of these pipes which are positioned over the curbed edge 186 are attached as described above in relation to the double landing handrail 178, while ends which are positioned over the prefabricated junction landing support bearer 206 are supported by a handrail baluster 254 (see Figure 1) of a prefabricated handrail 256 (see Figure 1) which is identical to the prefabricated double landing handrail 168. Referring to Figures 11a and 11b, plastic handrail end caps 258 fit into terminal ends of upper and lower handrails of prefabricated handrail 256.

The prefabricated landing floor panel 182 is connected to the house 30 via a prefabricated floor panel 32 by attaching one end of the floor panel 32 to it via holes 201 which are positioned opposite the curbed edge 186.

Referring to Figures 25a and 25b, a curb adaptor 270 joins inside curbed edges 42 of aluminium plates 40 which abut the prefabricated landing floor panel 182. The curb adaptor 270 is 70 mm wide and is formed out of the same aluminium material that forms the aluminium plates 40. Wing sections 272 of the curb adaptor 270 extend at an angle of 45° to the body of the adaptor 270, a distance of 30 mm.

Referring to Figures 26a and 26b, although the modular ramp 10 does not include steps, platforms, walkways and ramps may include steps such as steps 280. The steps 280 include 35 x 35 x 1.6 RHS galvanised steel tubes 282 and aluminium plate 284 formed of the same material which forms the aluminium plate 40 and folded into four regions 286, 288, 290 and 292. The aluminium plate 284 is 1,000 mm long. Regions 286, 288, 290 and 292 are respectively 25, 180, 250 and 180 mm wide.

Referring to Figures 27 and 28, a curved roof sheet 300 is attached to the modular ramp 10 via roof pillars 302. Referring to Figure 29, the curved roof sheets 300 are the same length as the corresponding floor panels 32, 130 and 182 which they are positioned over by roof pillars 302. The roof pillars 302 are formed of 40 x 40 x 2 RHS galvanised steel tube 1900 mm in length which is designed to slide over an upper end of floor pillars 14 or 15 so that a lower edge of the roof pillar 302 abuts an upper edge of the floor pillar sleeves 56 as shown in Figure 27.

Referring to Figures 27 and 28, 25 x 20 x 50 U-shaped channel beams 304 are attached to side edges of the curved roof sheet 300 by any appropriate means of attachment. For example, they may be attached by rivets, screws, bolts or welds. 50 x 25 x 2 RHS galvanised steel tube 306 is then attached via an underneath wall (as viewed in Figures 27 and 28) to the U-shaped beam 304. The RHS tube 306 can similarly be attached by any other appropriate means. The U-shaped beams 304 and RHS tubes 306 are attached to the curved roof sheet 300 prior to delivery of the curved roof sheet to a site where the modular ramp 10 is to be erected. The assembled curved roof sheet 300, U-shaped beam 304 and RHS tube 306 may be pre-assembled with the roof pillars 302. However, in most situations assembly would occur on site.

Referring to Figures 30a and 30b, the RHS tube 306 is attached to roof pillars 302 via an attachment plate 308. A cut out region 310 formed in upper ends of the roof pillars 302 is designed for receipt of RHS tubes 306 in a manner which accommodates the curvature of the curved roof sheet 300. The attachment plate 308 is welded to the upper end of the roof pillar 302 via welds 312 (see Figure 30a). Referring to Figures 28 and 30a, the RHS tubes 306 are attached to the attachment plate 308 via screws 314 so that RHS tubes 306 of adjacent curved roof sheets 300 meet approximately centrally of the roof pillar 302. Referring to Figure 30b, a 40 x 5 locating plate 316 further securely locates adjacent RHS tubes 306 of adjacent curved roof sheets 300 relative to each other.

Figures 31 a, 31 b and 31 c show how the roof of incline region 20 meets the roof of the double landing 24. The roof of incline region 20 is formed in the same manner as that described above in relation to other regions of the modular ramp 10 with the following exceptions. Each end of a curved roof sheet of incline region 20 extends to an outer wall of a roof pillar 318 which is roughly aligned with an end edge of the curved roof sheet, rather than a mid-point of a roof pillar as described above in situations where a curved roof sheet 300 abuts an end edge of an adjacent curved roof sheet 300. An attachment plate 320 corresponds to attachment plate 308 except that it does not extend past the outer wall of a roof pillar 318 which is roughly aligned with an end edge of the curved roof sheet. A locating plate 322 is similar to the locating plate 316 with the exception that it is modified in a similar way to the modification described above in relation to attachment plate 320.

In certain situations, in order to comply with relevant standards, it is necessary to include a level aluminium plate in order to break a constant incline which is greater than a particular distance. Therefore, in some situations, it is necessary to provide an aluminium plate (not shown) which is 1203 mm in length but otherwise identical to the plate 40.

The modular ramp 10 is suitable for temporary or permanent applications. In the case of temporary applications it can be disassembled, the disassembled components forming part of a pool of components that can be used to assemble a new modular ramp 10, in another location.

Modular ramps suitable for different applications to those described above in relation to the modular ramp 10 can be formed by the appropriate number and combination of components forming the modular ramp 10. In some cases this will mean that a greater number of a particular component described in relation to the modular ramp 10 is required. In other cases, a particular component described in relation to the modular ramp 10 will not be required.

The components described above are examples of components that can be used to form a platform, walkway or ramp. As indicated above, any given component can, for example, be modified by combining part of it with part of another component providing a similar function. Modifications may be required to satisfy specific design requirements which could involve altering the size and shape of a component, or the position of a component or part of a component. For example, dimensions of the aluminium plates referred to above can be altered to suit specific design or regulatory requirements. This may involve altering the size, number and/or spacing of the aluminium tubes so that they provide a corresponding aluminium plate with the appropriate structural integrity. It may also, for example, involve altering the length and size of the floor bearers.

It will be understood that the invention disclosed and defined in this specification extends to all alternative combinations of two or more of the individual features mentioned or evident from the text and/or drawings. All of these different combinations constitute various alternative aspects of the invention.

Various changes and modifications may be made to the embodiments described and illustrated without departing from the present invention.